

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 03/00/78		3. REPORT TYPE AND DATES COVERED
4. TITLE AND SUBTITLE DESIGN OF THE PRECIPITATION AND SEDIMENTATION STAGE FOR CONDITIONING WATER FROM WELL 118 PRIOR TO UV OZONATION			5. FUNDING NUMBERS	
6. AUTHOR(S) LAWLESS, H.				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO			8. PERFORMING ORGANIZATION REPORT NUMBER 81356R69	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG, MS			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES			12b. DISTRIBUTION CODE	
12a. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED				
13. ABSTRACT (Maximum 200 words) SEVEN EXPERIMENTS WERE CONDUCTED UNDER THE OBJECTIVE OF TESTING OF PRECIPITATE FORMATION EFFICIENCY OF AIR, OXYGEN, AND OXYGEN OZONE; ESTIMATE THE TURBIDITY PRODUCED BY OZONATION OF THE SUPERNATANT OR FILTRATE. HYDROGEN PEROXIDE WAS INCLUDED IN SOME SMALL SCALE EXPERIMENTS. INCLUDED WITH THE REPORT IS A CHART ON THE SCHEDULE FOR PROCESS DEVELOPMENT, SOURCE TREATMENT SYSTEM DEVELOPMENT AND ANOTHER GRAPH ENTITLED MANGANESE HYDROXIDE SEDIMENTATION AT 640 F AND PH10, WELL 118 WATER CARBON TREATED.				

DTIC
ELECTE
FEB 06 1995
S G D

19950130 084

DTIC QUALITY INSPECTED 3

14. SUBJECT TERMS TREATMENT, GROUNDWATER, CHEMICALS, ORGANIC MATERIALS			15. NUMBER OF PAGES	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	

Copy GIVEN TO: Doug Trump

PROGRESS REPORT

ORIGINAL
81356R69

WORK STATEMENT OF JAN 1978 FOR RESEARCH SERVICES

CONTAMINATION CONTROL DIRECTORATE
Rocky Mountain Arsenal
Commerce City, Colorado 80022

81356R69
original

Research Services for

Waterways Experiment Station
Vicksburg, Mississippi 39180

Supporting Program Under ITARMS Task No. 1.05.11

Consisting of

Design of the Precipitation and Sedimentation Stage for Conditioning Water
from Well 118 Prior to UV Ozonation

(See Test Plan Dated January 1978 for ITARMS Task No. 1.05.11 by Waterways
Experiment Station)

March 1978

H. L. Lawless, Process Development & Evaluation, RMA

Accession For	
NTIS	CRA&I <input checked="" type="checkbox"/>
DTIC	TAB <input type="checkbox"/>
Unannounced <input type="checkbox"/>	
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	

PROGRESS REPORT

METHODOLOGY:

Objective 1. is the testing of precipitate formation efficiency of air, oxygen, and oxygen ozone; estimate the turbidity produced by ozonation of the supernatant or filtrate. Hydrogen peroxide was included in some small scale experiments.

Under objective 1 - The following experiments have been conducted:

Experiment No. 1: Estimate of time to saturate tap water in settling tank with air:

A plastic reactor .706 ft² by 5 ft high was equipped with air pump and three diffusers. Nitrogen was bubbled through the diffusers for 4 hours. Air was then pumped through the diffusers at 4.8 ft³/min (measured at 62°F and 628 mm over water as it discharged from the reactor vent). Flow/ft² is 6.8 ft³/(hr-ft² of surface).

DATA FROM EXPERIMENT NO. 1

<u>Sample No.</u>	<u>Dissolved Oxygen (ppm)</u>	<u>Elapsed Hours</u>	<u>Reactor Temp</u>	<u>Gas Sweep</u>
7	6.6	0	0	--
1	1.6	4	54°F	4 Hrs N ₂
2	7.3	0.25	62°F	Air
3	7.8	0.75	62°F	Air
4	7.8	1.25	62°F	Air
5	7.8	1.75	62°F	Air
6	7.7	2.75	62°F	Air

CONCLUSION:

Reactor was saturated with oxygen in 15 minutes. Pump has adequate flow rate.

Experiment No. 2: Estimate effect of temperature, pH, and % Hydrogen Peroxide (HP) on dependent variables below. Reasoning is that aeration would volatilize a significant quantity of organics contained in Well 118 water while HP oxidation would avoid the problem.

DATA FROM EXPERIMENT 2 (5 DAYS RUN TIME)

	50°F				150°F			
	pH=7.6		pH=10.6		pH=7.0		pH=10.8	
	0% HP	.05% HP	0% HP	.05% HP	0% HP	.05% HP	0% HP	.05% HP
Y ₁ =Filterable Res. (%)	.978	.946	.882	.879	.935	.914	.930	.907
Y ₂ =Non-Filterable Res. (ppm)	70	80	2160	2080	380	460	3140	3020
Y ₃ =Iron (ppm)	0.22	.05	.05	.05	.11	.073	.073	.068
Y ₄ =Manganese (ppm)	34.6	27.2	0.13	.05	2.03	2.38	.05	.05
Y ₅ =% HP	.001	.001	.001	.001	.001	.001	.001	.001
Y ₆ =Extractable Organics (ppm)	22.2	24.4	12.9	19.2	12.1	16.5	8.6	11.6

Conclusions will be based on statistical analysis of the data. In general:

1. Iron was low in well water at 50°F, 0% HP, and pH 7.6. Air cushion in well tank may be responsible; nitrogen cushion being placed in tank.
2. Manganese is precipitated at higher pH; HP has some effect and heat aids precipitation.
3. Extractable organics show complex behavior but there is little indication of organics destruction by HP.

Experiment No. 3:

3-A Testing effect of nitrogen on volatilization of organics, filterable solids, and on iron and manganese precipitation. (The Fe/Mn data will be the baseline for aeration experiments).

3-B Aeration experiments using nitrogen treated Well 118 water -- measure loss of organics due to oxidation and precipitation of iron/manganese.

Samples in for analysis.

Experiment No. 4:

Oxygenation of above aerated water to compare air and oxygen.

Samples in for analysis.

Experiment No. 5:

Removed organic material from Well 118 water with activated carbon column.

Aerated and sampled to estimate iron, Mn, COD, and insolubles. Loss across carbon bed is to be estimated.

Samples in for analysis.

Experiment No. 6:

Oxygenation of water left from Experiment No. 5 (little or no precipitation seen).

Samples in for analysis.

Experiment No. 7:

Precipitation of manganese by increasing pH to 9.5. Will get preliminary sedimentation rate data from this.

This experiment is in progress.

Future experiments will involve ozone rather than air or oxygen. Want to avoid pH adjustment if possible. Will repeat some of above experiments. Sedimentation rate of ozone-formed precipitate will be measured.

4.0 PROCESS DEVELOPMENT -- SOURCE TREATMENT-SYSTEM DEVELOPMENT FY 78

JAN 78 -- SEPT 78

2 Feb 78

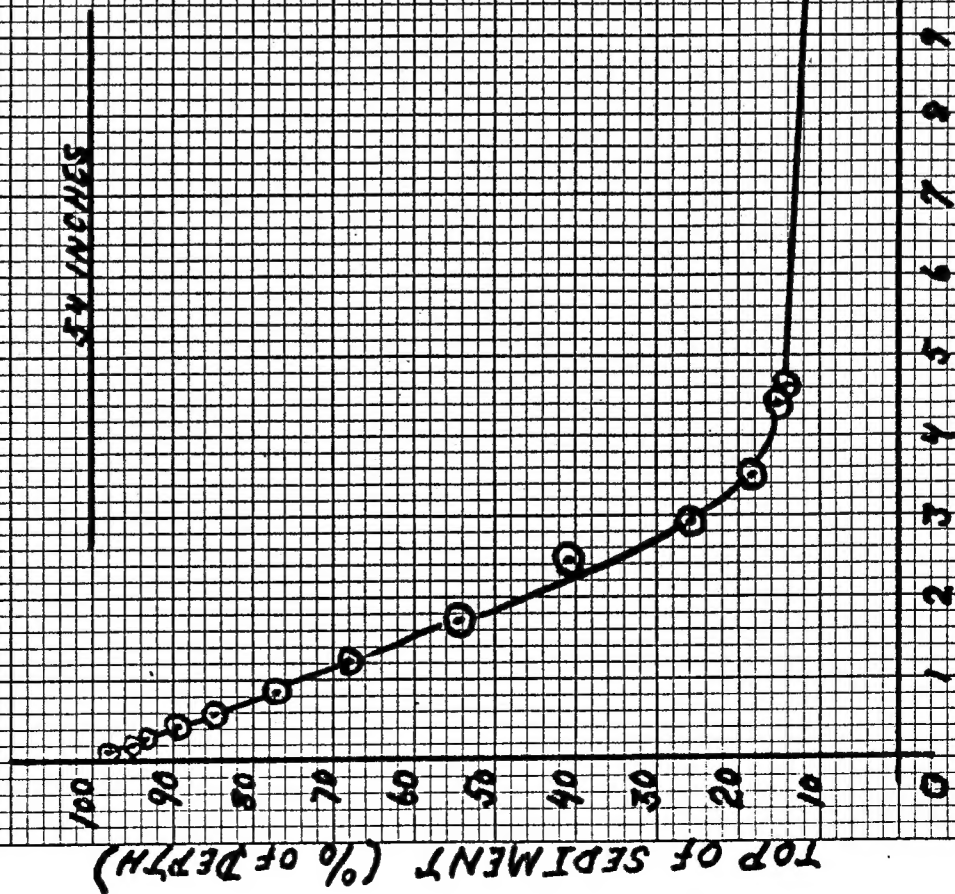
[illegible]

FIG. I

15 MAR 1978

MANGANESE HYDROXIDE SEDIMENTATION AT 69°F AND PH 10

WELL 118 WATER CARBON TREATED



NOTE: WATER ABOVE TOP OF SEDIMENT
WAS CRYSTAL CLEAR

HOURS SEDIMENTATION

PROGRESS REPORT

METHODOLOGY:

Objective 1. is the testing of precipitate formation efficiency of air, oxygen, and oxygen ozone; estimate the turbidity produced by ozonation of the supernatant or filtrate. Hydrogen peroxide was included in some small scale experiments.

Under objective 1 - The following experiments have been conducted:

Experiment No. 1: Estimate of time to saturate tap water in settling tank with air:

A plastic reactor .706 ft² by 5 ft high was equipped with air pump and three diffusers. Nitrogen was bubbled through the diffusers for 4 hours. Air was then pumped through the diffusers at 4.8 ft³/min (measured at 62°F and 628 mm over water as it discharged from the reactor vent). Flow/ft² is 6.8 ft³/(hr-ft² of surface).

DATA FROM EXPERIMENT NO. 1

<u>Sample No.</u>	<u>Dissolved Oxygen (ppm)</u>	<u>Elapsed Hours</u>	<u>Reactor Temp</u>	<u>Gas Sweep</u>
7	6.6	0	0	--
1	1.6	4	54°F	4 Hrs N ₂
2	7.3	0.25	62°F	Air
3	7.8	0.75	62°F	Air
4	7.8	1.25	62°F	Air
5	7.8	1.75	62°F	Air
6	7.7	2.75	62°F	Air